Diseases of seeds, seedlings and roots:

Aphanomyces root rot

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Aphanomyces root rot

Photos:
Lyndon Porter, USDA-ARS

Aphanomyces

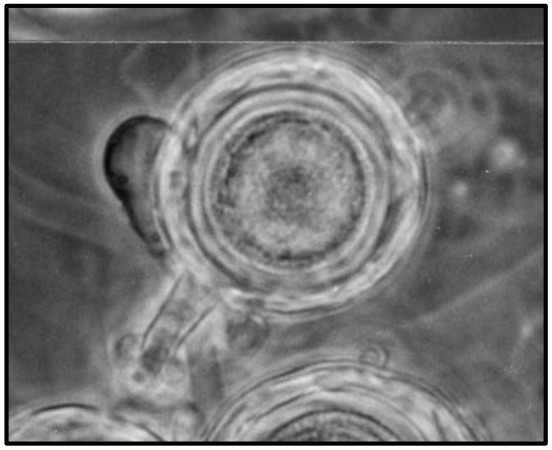
Symptoms:

- Initial root rot symptoms: honey-brown root and epicotyl tissue, often up to soil line
- Later root rot symptoms: necrotic root and epicotyl tissue, often up to soil line; poor nodulation
- Wilt: plants yellow from the bottom up

Aphanomyces

Causal pathogen: *Aphanomyces euteiches*
(an oomycete; “water mold”)

***Aphanomyces euteiches* produces oospores –** thick-walled resting structures **– in diseased tissue. Oospores persist in soils.**



viewed through a microscope

Photos: University of Wisconsin

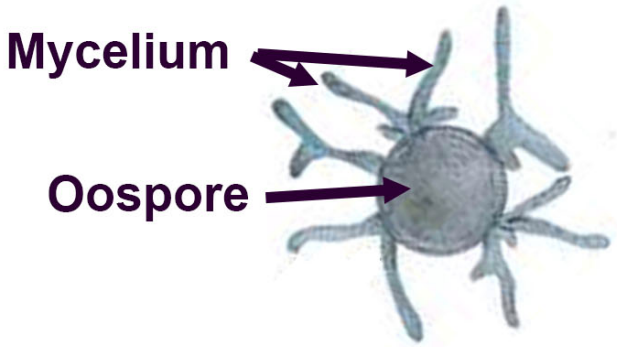
Aphanomyces

Oospores germinate in response to chemical exudates from roots of susceptible hosts.

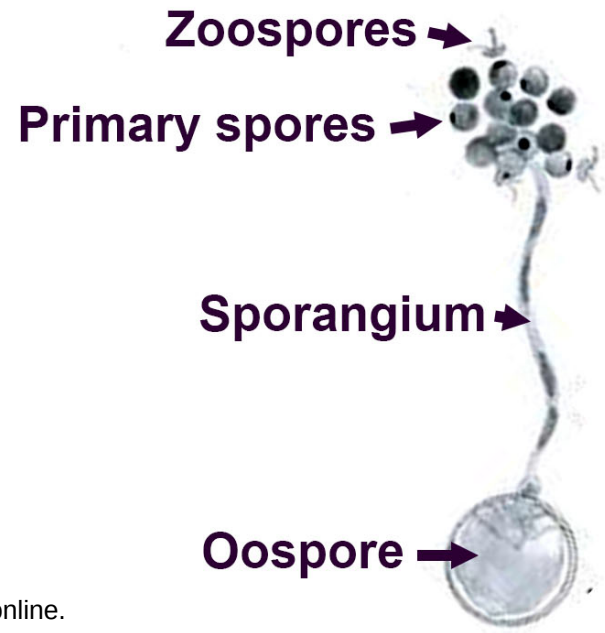
- **Germination is direct** (to produce mycelium) **or**
- **indirect** (to produce sporangia and zoospores).

Zoospores swim through water and water-saturated soil.

Direct germination



Indirect germination



Adapted from Hughes and Grau 2007.
Aphanomyces root rot (common root rot) of legumes. The Plant Health Instructor; online.

Aphanomyces

Aphanomyces typically becomes economically important after peas or lentils have been cropped to a field 3+ times

- The **first epidemic is usually preceded by a previous lentil or pea crop that yielded well but conditions were favorable for disease**, causing pathogen to increase
- **Long crop rotations are most important when last lentil or pea crop was grown in a wet year**

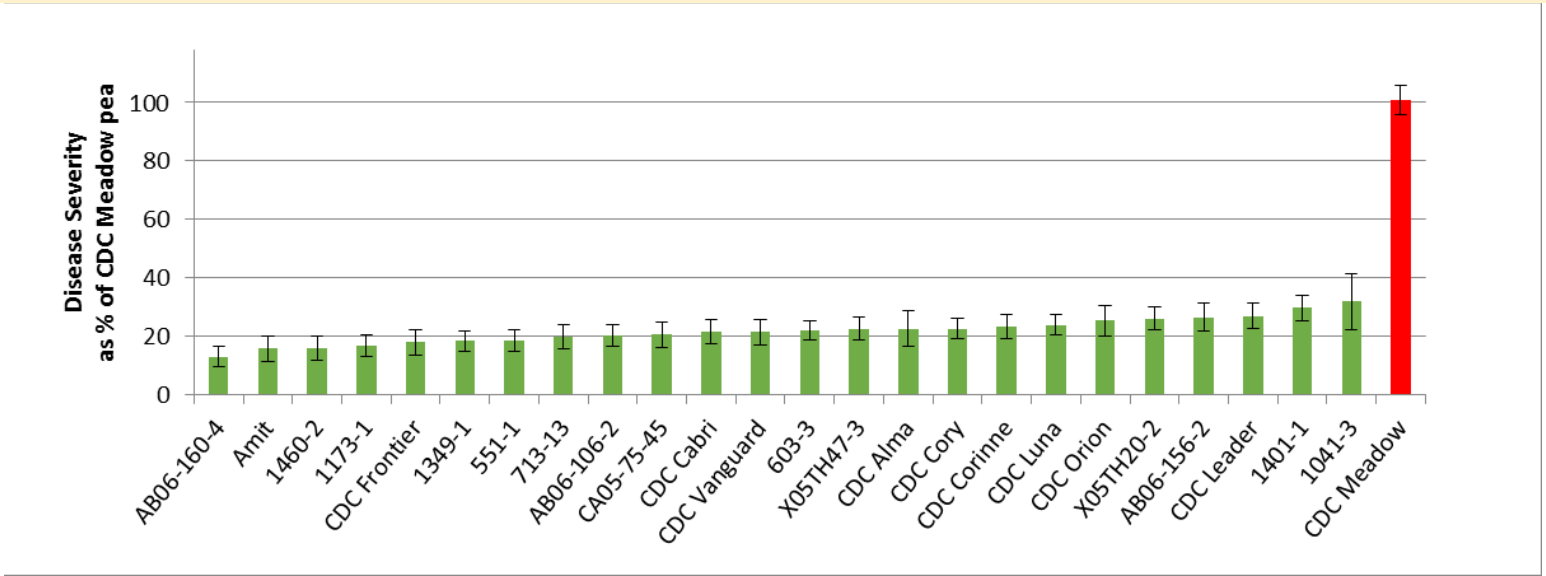
Aphanomyces

Susceptibility:

- Field peas, lentils >> chickpeas
  - Chickpeas are not very susceptible.
  - Lentils and field peas are highly susceptible.

Suceptibility to Aphanomyces, chickpeas vs. a representative field pea variety

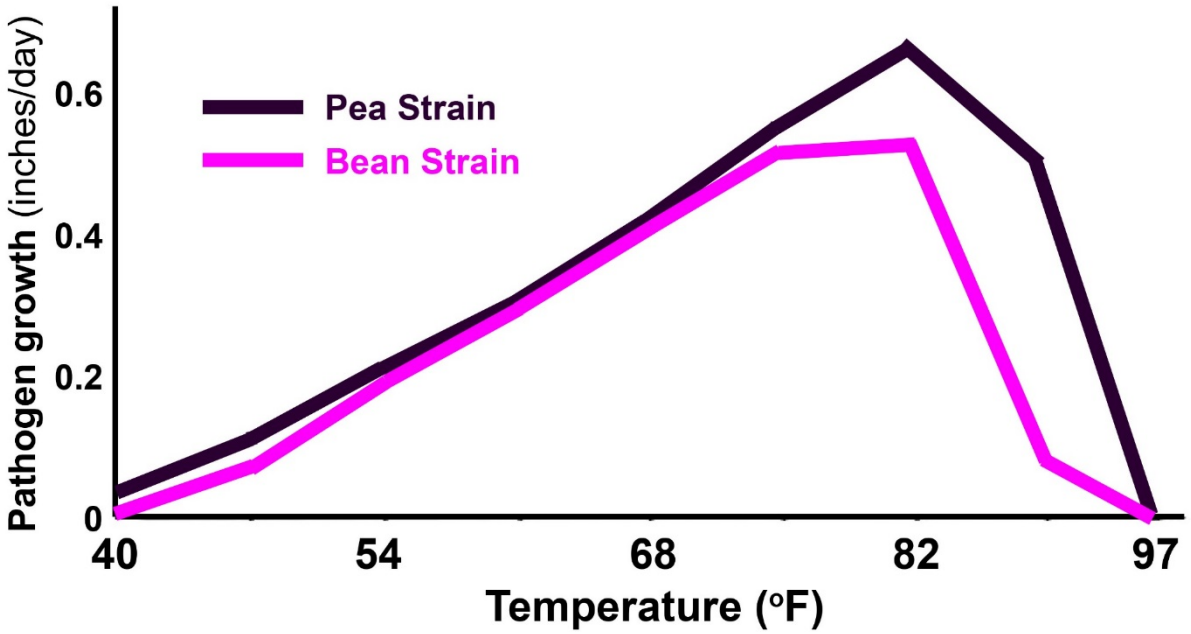
University of Saskatchewan (Cho and Banniza)



Aphanomyces

Conditions that favor infection:

- Soil moisture: high
- Soil temperature: high



Pfender and Hagedorn 1982 Phytopathology 72:306-310

Aphanomyces - Response to soil temperature

Disease development at **61˚F** (snap beans)

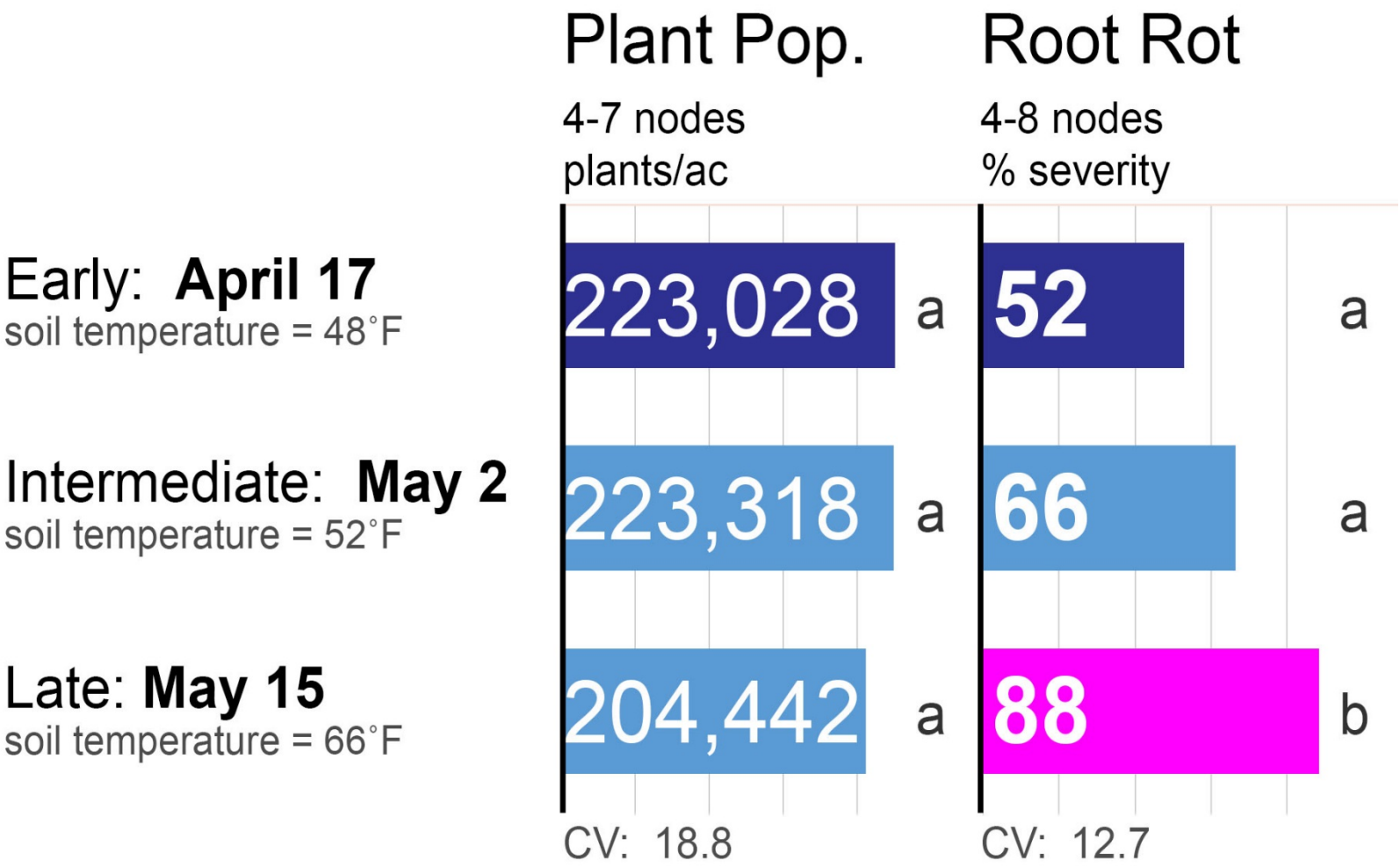
Non-inoculated Pythium Aphanomyces

Disease development at **82˚F** (snap beans)

Non-inoculated Pythium Aphanomyces

Pfender and Hagedorn 1982 Phytopathology 72:1200-1204

Aphanomyces - Response to planting date (field peas)

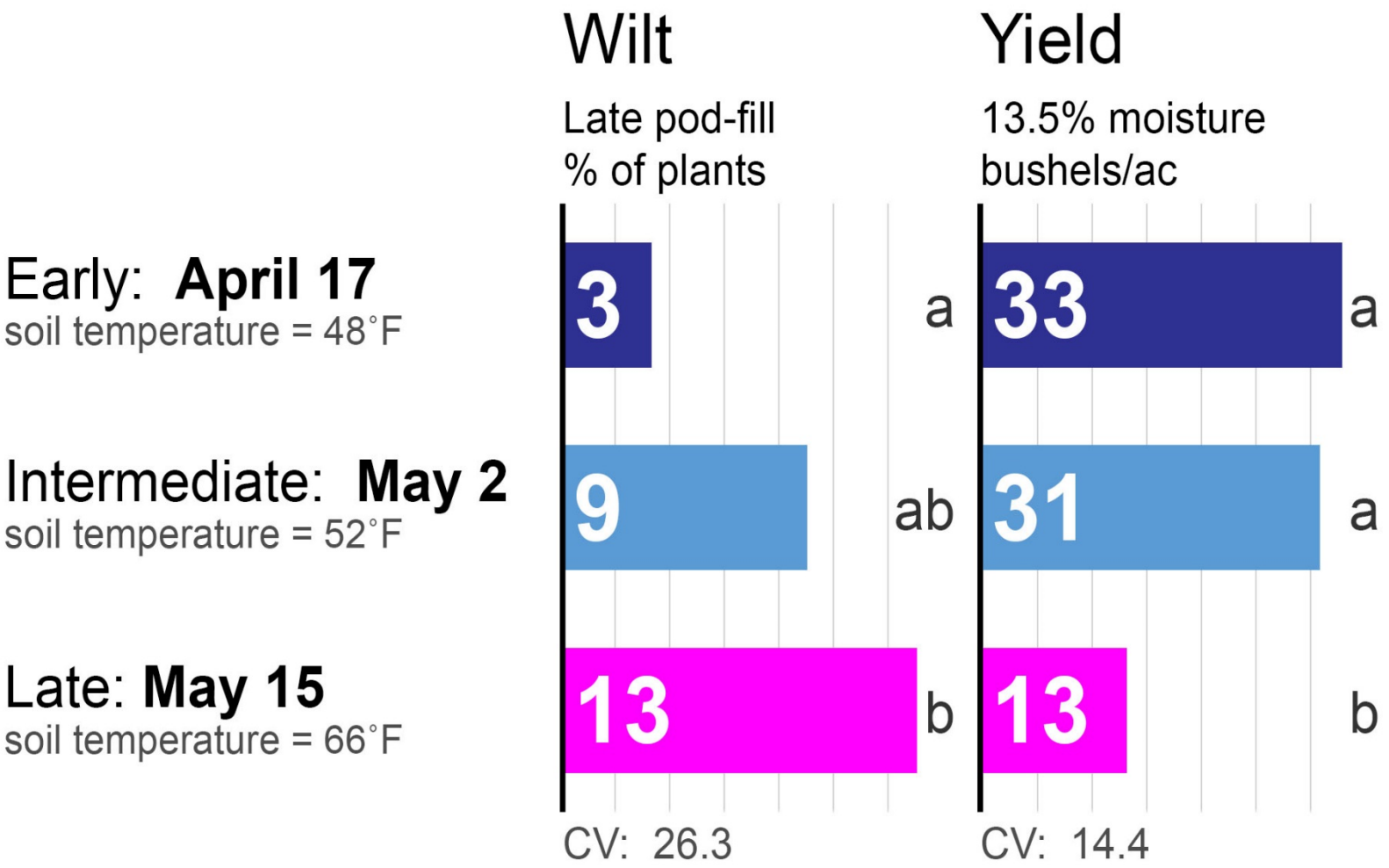


Variety: 'DS Admiral' (yellow-cotyledon type)
Seeding rate: 300,000 pure live seeds/ac **Direct-seeded** into wheat stubble

Seed treatment: Apron XL 0.16 fl oz/cwt + Apron Maxx RFC 1.5 fl oz/cwt + Rizolex 0.3 fl oz/cwt +/- Intego Solo 0.2 fl oz/cwt

Pathogen isolation: *Fusarium* sp. from **16%** of roots (early planting date), **8%** (intermediate), **25%** (late)
Aphanomyces sp. from **2%** of roots (early planting date), **13%** (intermediate), **0%** (late)

Aphanomyces - Response to planting date (field peas)



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Aphanomyces

Seed treatments:

- Metalayxl and mefenoxam: ineffective.
- Ethaboxam (Intego Solo): registered on lentils and chickpeas.

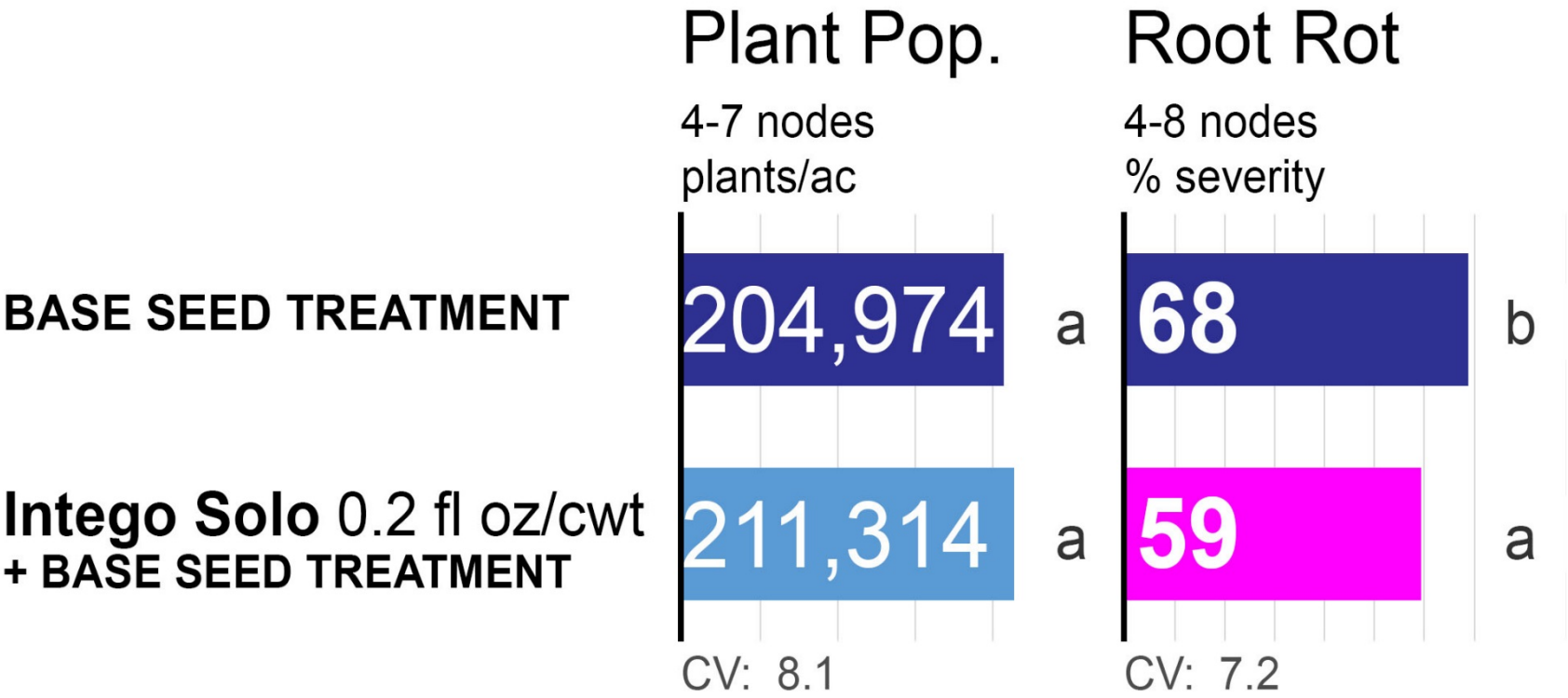
Control of Aphanomyces with seed treatments is difficult:

- Aphanomyces root rot develops during vegetative growth and bloom, when the concentration of fungicide active ingredients in the target tissues (tap root, epicotyl) is low.

Aphanomyces – Efficacy of seed treatments (field peas)

Intego Solo, 0.2 fl oz/cwt

Ethaboxam, 2.27 g ai/cwt



BASE SEED TREATMENT:

Cruiser 1.28 fl oz + **Apron XL** 0.16 fl oz + **ApronMaxx RFC** 1.5 fl oz + **Rizolex** 0.3 fl oz

Variety: 'DS Admiral' (yellow-cotyledon type)
Seeding rate: 300,000 pure live seeds/ac **Direct-seeded** into wheat stubble

Pathogen isolation: *Fusarium* sp. from **15%** of roots and *Aphanomyces* sp. from **5%** of roots

Aphanomyces – Efficacy of seed treatments (field peas)

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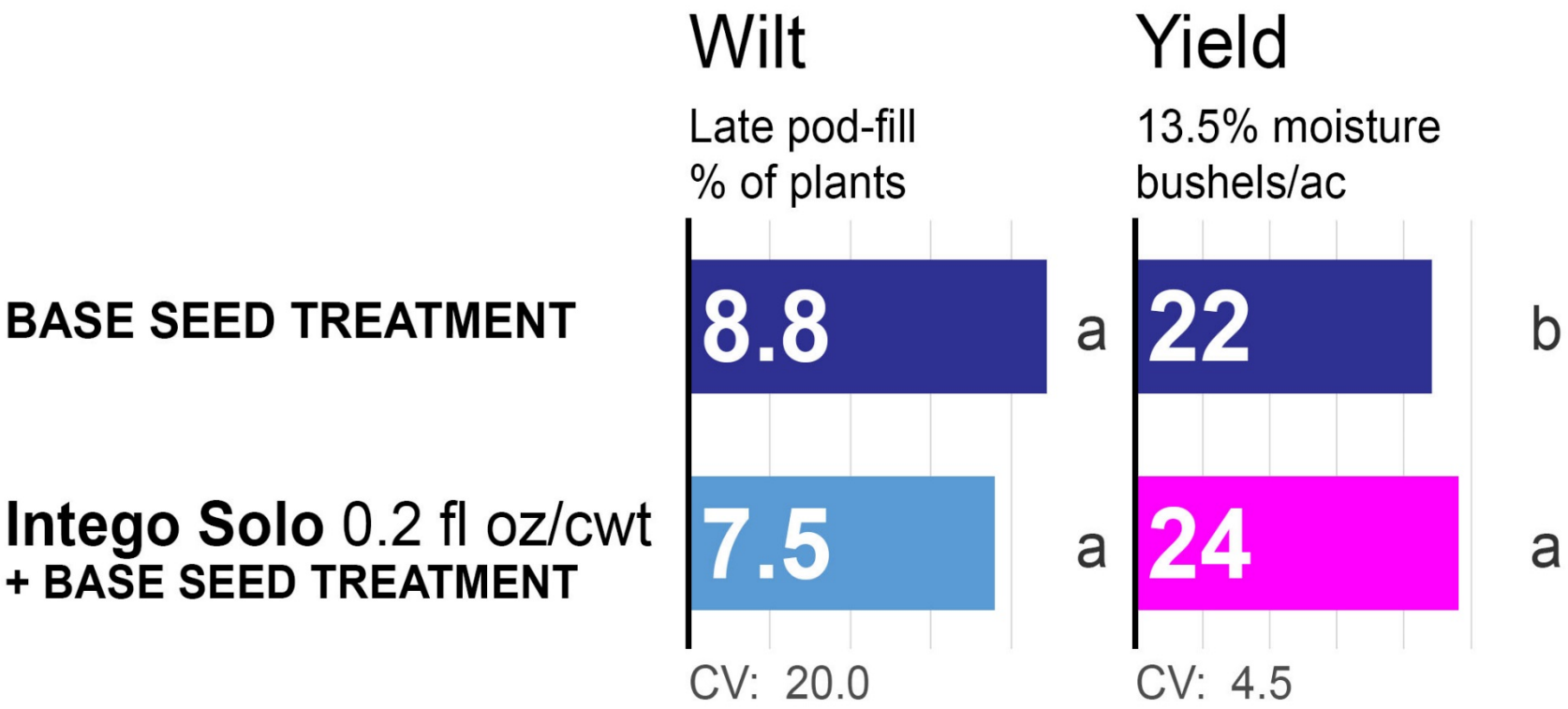

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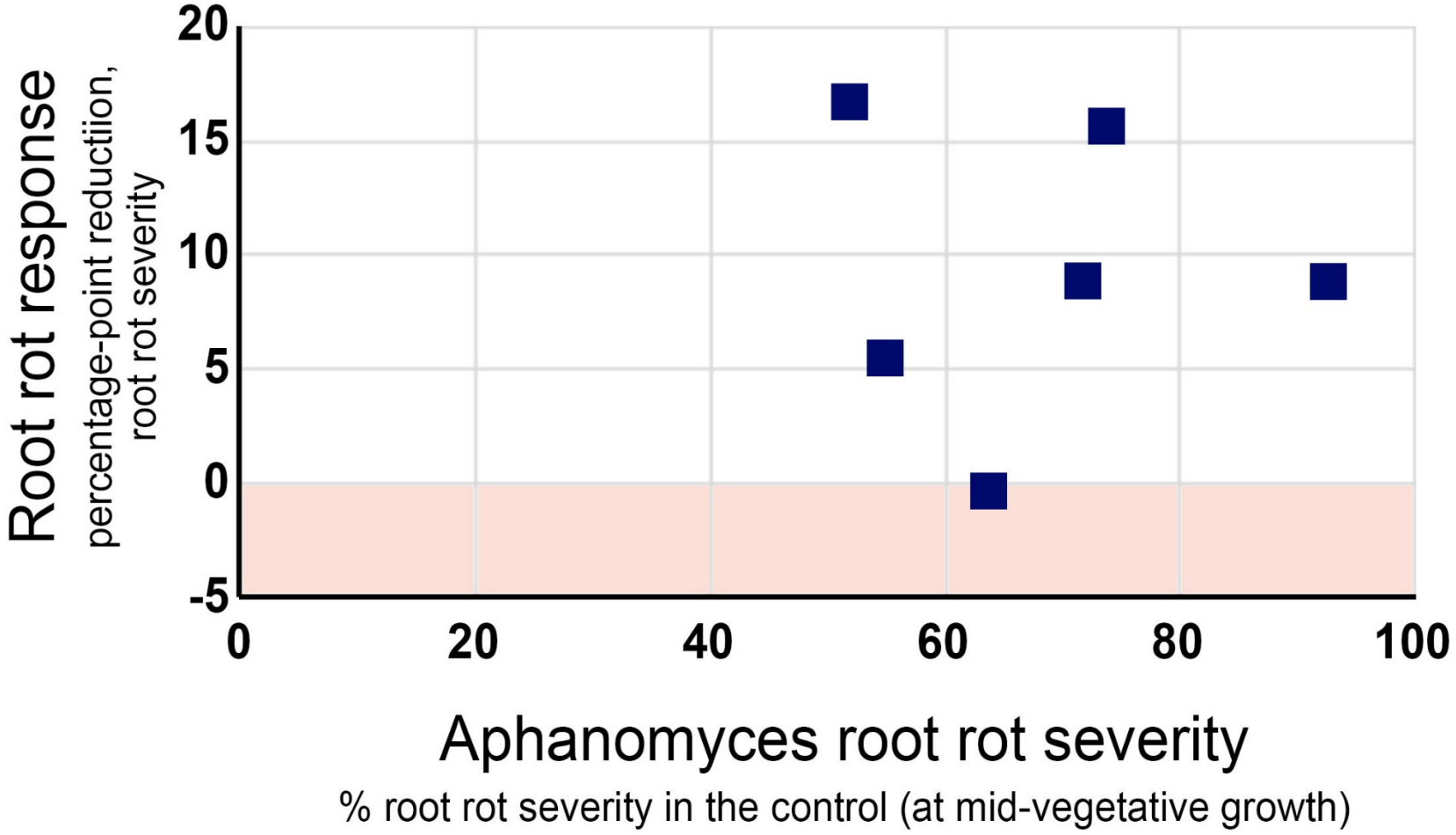
Response to seed treatment (field peas):

Intego Solo, 2.0 fl oz/cwt



- Unique planting date and/or crop residue environment; Carrington, ND (2016)

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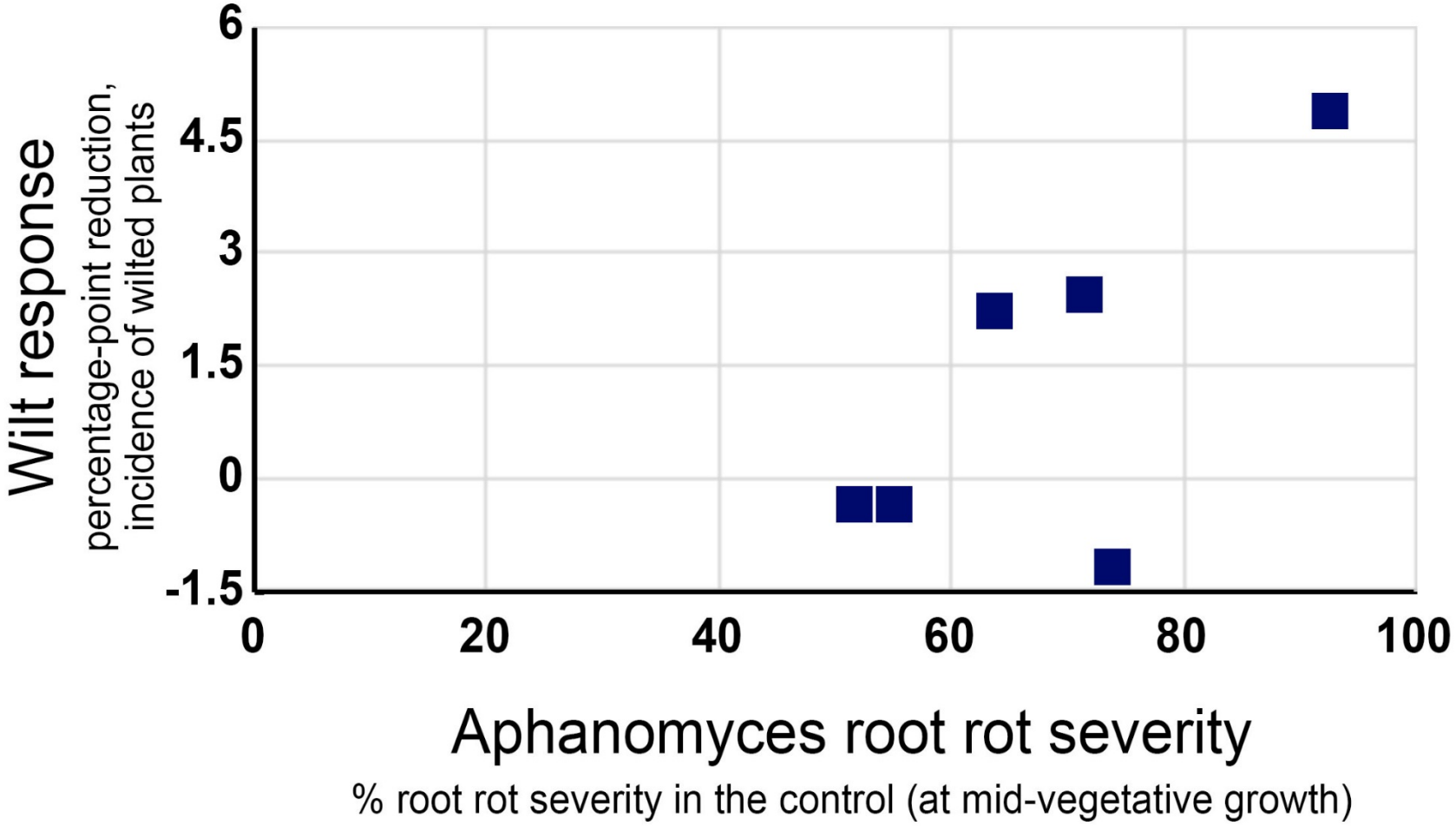
Intego Solo, 2.0 fl oz/cwt



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Response to seed treatment (field peas):

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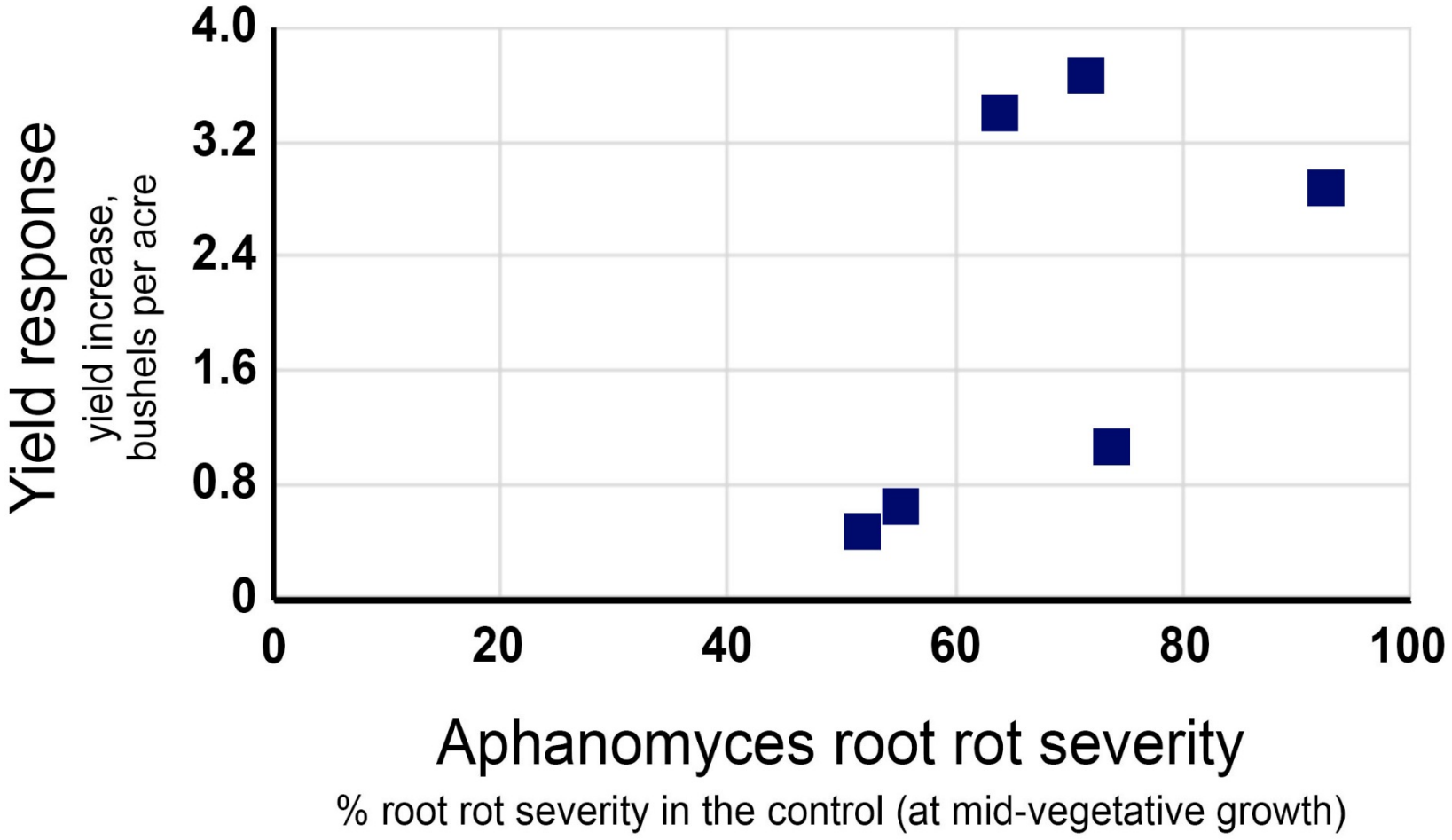
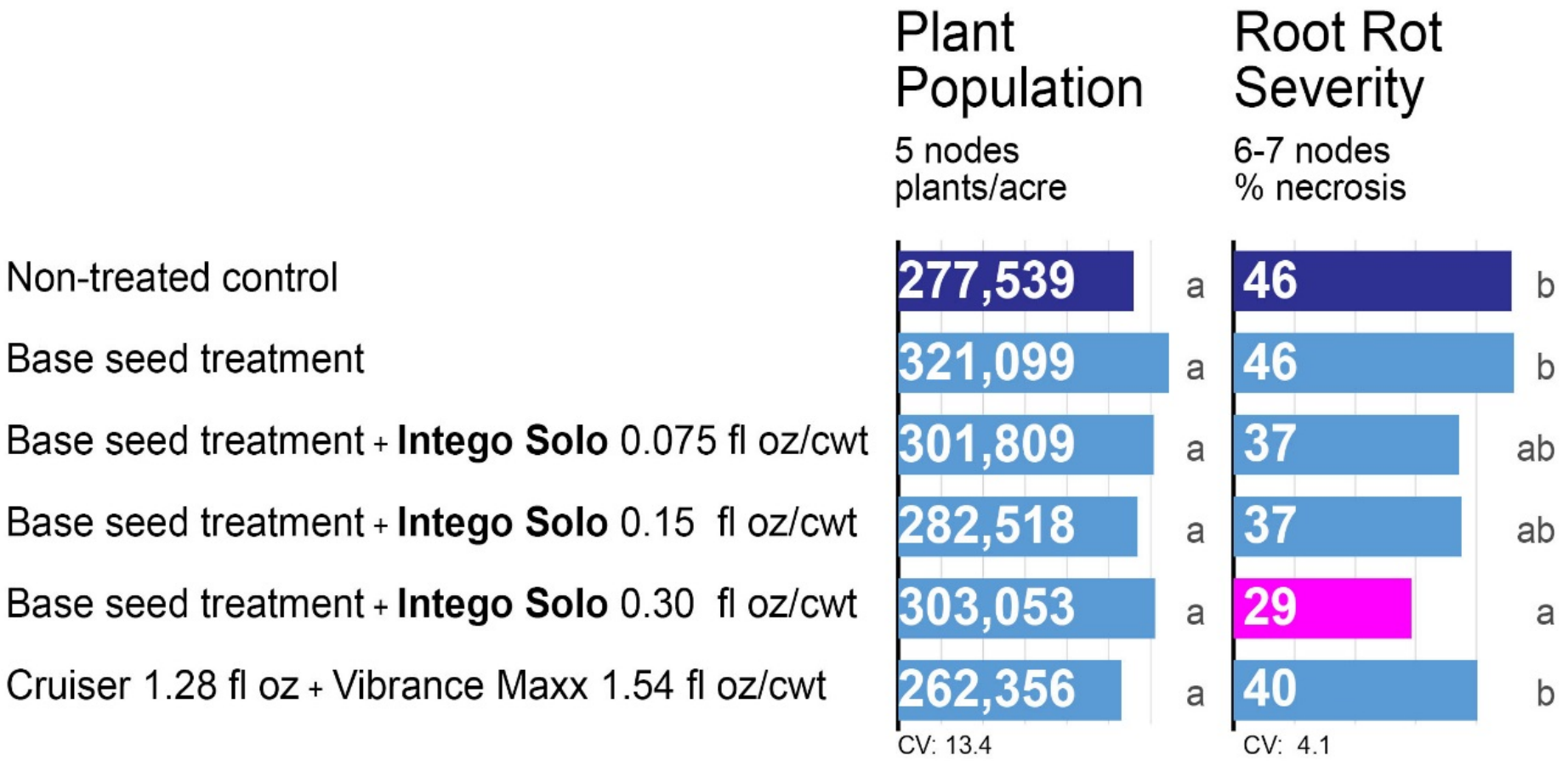


- Unique planting date and/or crop residue environment; Carrington, ND (2016)

Aphanomyces – Efficacy of seed treatments (field peas)

Intego Solo, 0.075 to 0.30 fl oz/cwt

Ethaboxam, 0.85 to 3.40 g ai/cwt



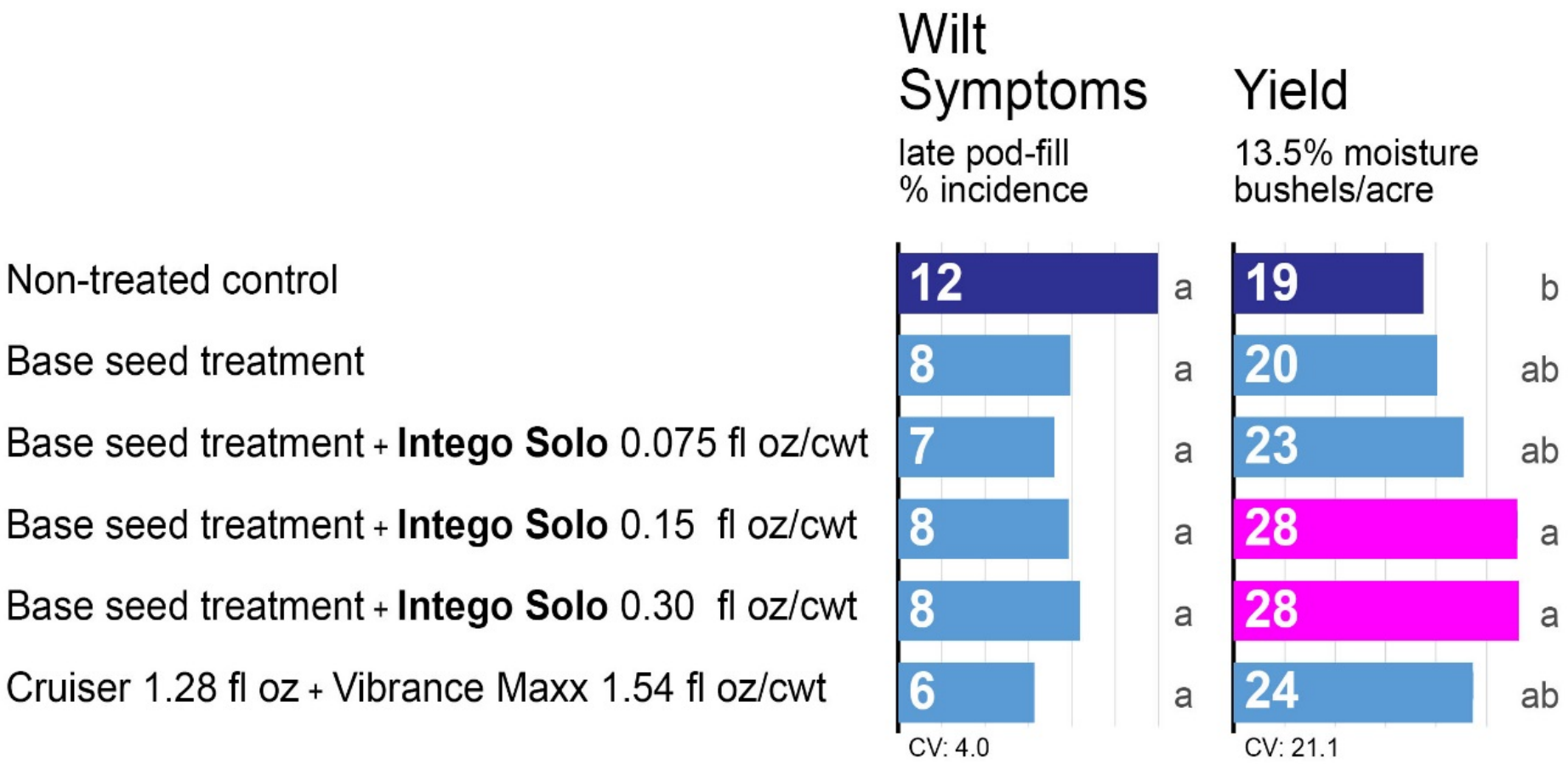
Base seed treatment = Cruiser 1.28 fl oz + Spirato 0.08 fl oz + S-2200 0.4 fl oz + Sebring 0.5 fl oz/cwt

Variety: 'Abarth' (yellow-cotyledon type) **Seeding rate:** 330,000 pure live seeds/ac **Direct-seeded** into wheat stubble

Aphanomyces – Efficacy of seed treatments (field peas)

Intego Solo, 0.075 to 0.30 fl oz/cwt

Ethaboxam, 0.85 to 3.40 g ai/cwt



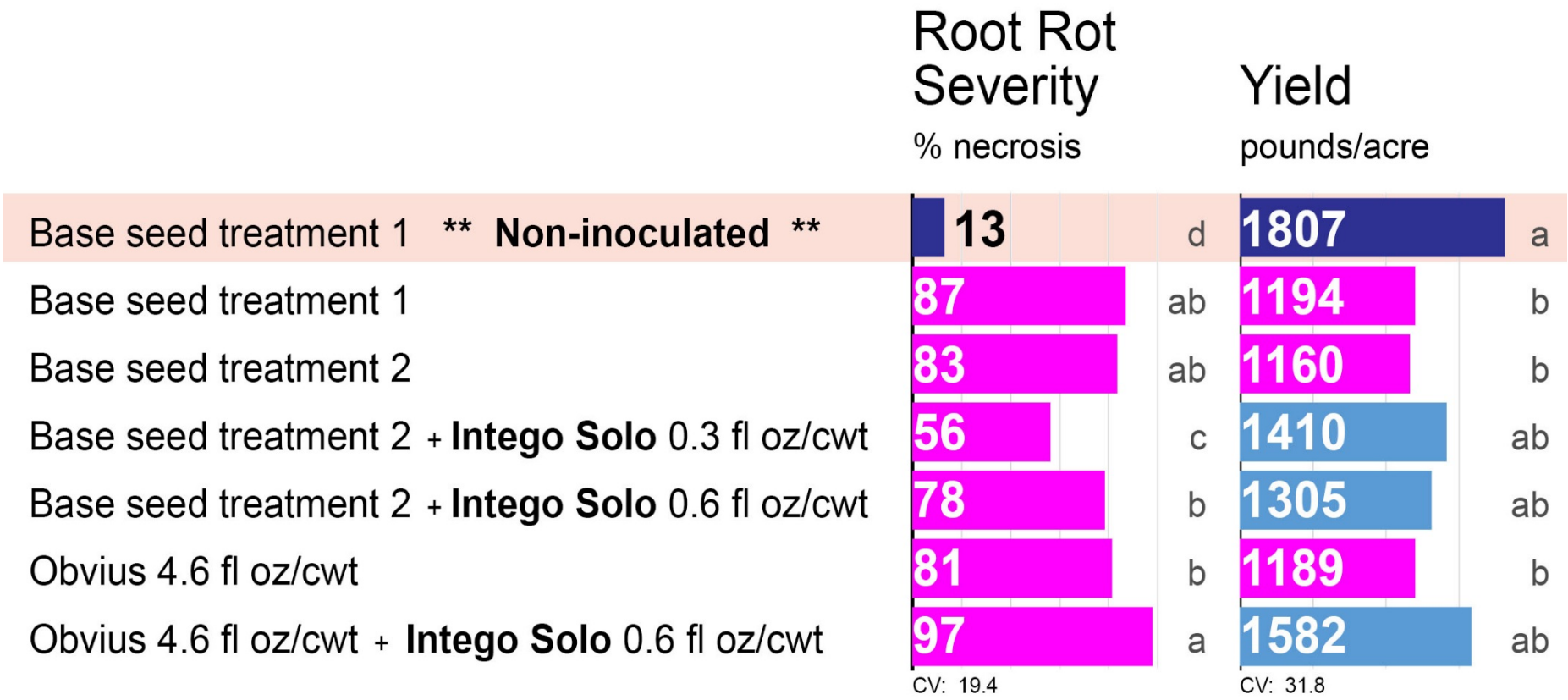
Base seed treatment = Cruiser 1.28 fl oz + Spirato 0.08 fl oz + S-2200 0.4 fl oz + Sebring 0.5 fl oz/cwt

Carrington, ND (2017) **Variety:** 'Abarth' **Seeding rate:** 330,000 pure live seeds/ac **Direct-seeded** into wheat stubble

Aphanomyces – Efficacy of seed treatments (lentils)

Intego Solo, 0.30 and 0.60 fl oz/cwt

Ethaboxam, 3.40 to 6.80 g ai/cwt



Base seed treatment 1 = Cruiser 0.80 fl oz + Maxim 0.08 fl oz/cwt
Base seed treatment 1 = Cruiser 0.80 fl oz + Maxim 0.08 fl oz + Allegiance FL 0.25 fl oz/cwt

DATA generated in Canada; obtained from Valent USA

Thank you!

Funding sources:

North Dakota Crop Protection Product Harmonization Board & Registration Board
Northern Pulse Growers Association, BASF, Valent USA, Bayer, Syngenta